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Indian Standard

AGRICULTURAL PRODUCE MILLING MACHINERY – EMERY STONES FOR BURR FLOUR MILLS – SPECIFICATION

(First Revision)

भारतीय मानक

कृषि उत्पाद प्रेषण मशीनादि – आटा चक्की के लिए एमरी पत्थर – विशिष्टि

(पहला पुनरीक्षण)

UDC 664·71 : 621·922·2

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NEW DELHI 110002

November 1989 **Price Group 3**

Agricultural Produce Milling Machinery Sectional Committee, AFDC 63

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 28 April 1989, after the draft finalized by the Agricultural Produce Milling Machinery Sectional Committee had been approved by the Agricultural and Food Products Division Council.

A large number of conventional flour 'burr' mills are used for milling the grain. These mills have two discs (a pair). The runner stone rotates with the shaft and the fixed (stationary) stone is attached to the cover towards the pulley side maintaining the grinding surface in a horizontal plane or in a vertical plane depending upon the type of the mill. The cover plate invariably covers the fixed stone.

This standard covering the requirements of emery stone used in such mills was published in 1983. In order to solve certain problems faced in implementation of the standard, a need was felt to revise the standard.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AGRICULTURAL PRODUCE MILLING MACHINERY – EMERY STONES FOR BURR FLOUR MILLS – SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard prescribes the requirements and methods of sampling and tests for emery stones used in 'burr' flour mills.

2 REFERENCES

IS No.	*Title*
IS 210 : 1978	Specification for grey iron castings (*third revision*)
IS 254 : 1973	Specification for magnesium chloride (*second revision*)
IS 1124 : 1974	Method of test for determination of water absorption, apparent specific gravity and porosity of natural building stones (*first revision*)
IS 2062 : 1984	Specification for weldable structural steel (*third revision*)
IS 4905 : 1968	Methods for random sampling
IS 7775 : 1975	Specification for ceramic grinding media and lining
IS 10132 : 1982	Method of test for materials for use in the preparation of magnesium oxychloride flooring compositions

3 TYPES

3.1 The emery stones shall be of following two types:

a) Horizontal type (*see* Fig. 1), and
b) Vertical type (*see* Fig. 2).

3.2 The emery stone made of synthetic and natural emery grains (*see* **5.3**) shall be designated as SE and NE respectively.

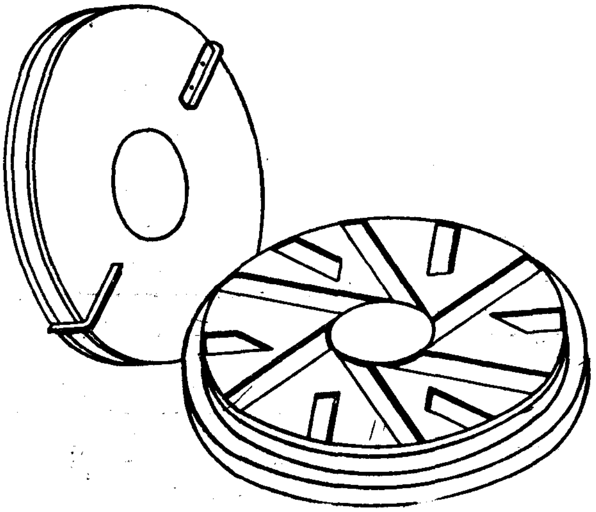
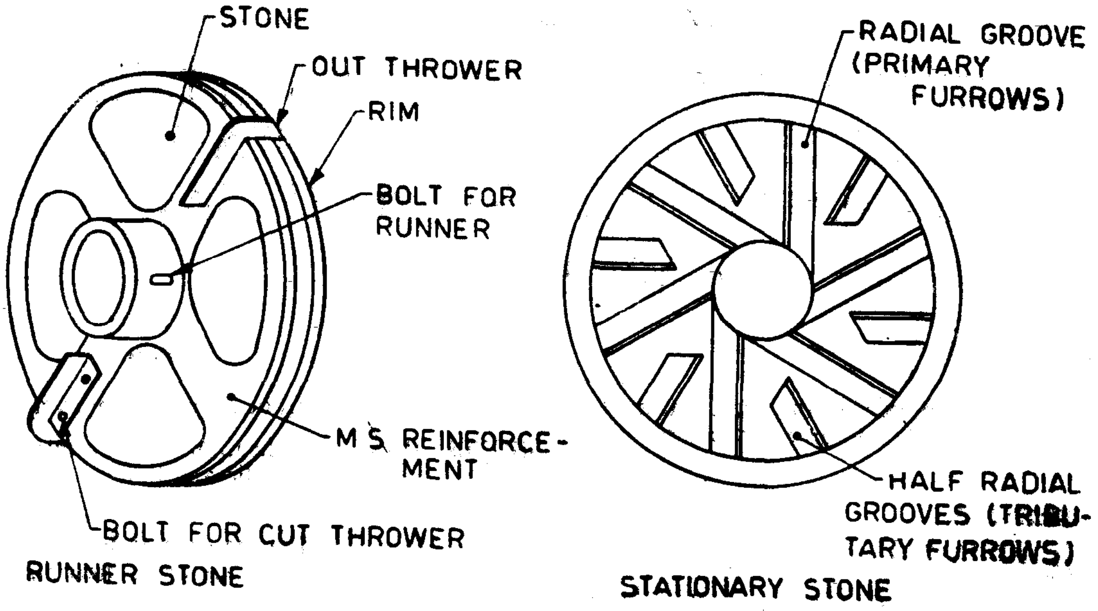


FIG. 1 TYPICAL EMERY FLOUR MILL STONES
(HORIZONTAL TYPE)



RUNNER STONE

STATIONARY STONE

FIG. 2 TYPICAL EMERY FLOUR MILL STONES (VERTICAL TYPE)

4 MANUFACTURE

4.1 Emery stones shall be manufactured by thoroughly mixing calcined magnesite powder, magnesium chloride solution and emery grains in suitable proportion; casting them in suitable cast iron moulds at a temperature of 27 ± 3°C and at minimum of 70 percent relative humidity.

5 RAW MATERIAL

5.1 Calcined Magnesite

5.1.1 *Chemical Composition*

The chemical composition of calcined magnesite when tested according with the method given in IS 10132 : 1982 shall be as specified in Table 1.

Table 1 Chemical Requirement of Calcined Magnesite

Sl No.	Characteristic	Requirement
(1)	(2)	(3)
i)	Magnesium oxide (MgO), percent by mass	85, *Min*
ii)	Calcium oxide (CaO), percent by mass	2, *Max*
iii)	Carbon dioxide (CO_2), percent by mass	2·5, *Max*
iv)	Loss on ignition (carbon dioxide and water), percent by mass	5, *Max*
v)	Total contents of MgO, Al_2O_3, Sio_2 and loss on ignition, percent by mass	99, *Max*

5.1.2 *Physical Requirements*

The physical requirements of calcined magnesite when tested in accordance with the method given in IS 10132 : 1982 shall be as specified in Table 2.

Table 2 Physical Requirement of Calcined Magnesite

Sl No.	Characteristic	Requirement
(1)	(2)	(3)
i)	Bulk density, kg/l	0·65 to 0·85
ii)	Fineness, percent by mass passing through 170 mesh sieve	90, *Min*
iii)	Setting time, minutes	
	a) Initial	50, *Min*
	b) Final	120, *Min*
iv)	Linear change, percent: (Average change in length)	
	a) During expansion	0·15, *Max*
	b) During contraction	0·25, *Max*

5.2 Magnesium Chloride

The magnesium chloride used in the manufacture of stone shall conform to Grade 3 of IS 254 : 1973.

5.3 Emery Grains

Emery grains used in the manufacture of emery stones shall be either synthetic or natural. The requirement of emery grain shall be as given in Table 3. The grit No. 10, 12, 14, 16, 18 or 20 shall be used.

Table 3 Requirements of Grain

(*Clause* 5.3)

Sl No.	Characteristic	Requirement	
		Synthetic Emery Grain	Natural Emery Grain
(1)	(2)	(3)	(4)
i)	Aluminium oxide (Al_2O_3), percent by mass	60, *Min*	May or may not be present. If present, it shall be not more than 30
ii)	Iron oxide (Fe_2O_3), percent by mass, *Max*	15	15
iii)	Magnetic particles (including metallic iron), percent, *Max*	1	1
iv)	Specific gravity, *Min*	3·6	2·5
v)	Hardness on Mohs scale, *Min*	8	7

NOTE—While testing for percentage quantity of aluminium oxide, the material fused with approximately 10 times its mass of potassium bisulphate shall form a clear fusion which on cooling shall dissolve completely in dilute hydrochloric acid.

5.4 Reinforcement Material

The reinforcement of the runner stone shall be done with a suitable material preferable with cast iron of Grade G 150 conforming to IS 210 : 1978 or mild steel of grade Fe 410 W conforming to IS 2062 : 1984.

6 CONSTRUCTION

6.1 The lining shall be uniform in thickness and texture. The lining surface shall have adequate redial grooves of suitable width. It may also have adequate number of radial grooves of the same width. The stationary stones shall have seven threaded holes, each having M 12 diameter pitch combination to suit the three bolt or four bolt discs.

7 DIMENSIONS

7.1 The vertical and horizontal stones shall comply with the dimensional requirements specified in Tables 4 and 5, respectively.

7.2 Pitch circle diameter for 3 or 4 hole stones shall be as under:

a) For 4 hole : 190, 260, 300, 370, 425 mm; and

b) For 3 hole : 190, 295, 330, 425 and 500 mm.

7.2.1 The tolerance on the declared diameter shall be ±1 mm.

8 TESTS

8.1 Tensile Strength

The average tensile strength of three bricket cubes casted from the original mortar which is being used for the casting of emery stone at 27 ±3°C temperature shall be as follows:

Tensile Strength	*Requirement*
a) After 7 days	6 200 kN/m^2, *Min*
b) After 28 days	7 585 kN/m^2, *Min*

8.2 Steam Test

A bricket cube may be used as a specimen for day-to-day steam test. The specimen at any time after 3 days from its casting when steam heated

Table 4 Dimensional Requirements for Emery Stones for Flour Mills, Vertical Type

(*Clause* 7.1)

Sl No.	Diameter	Bore Size (Runner Stone)	Thickness of Each Stone (Runner and Fixed Stones)	Diameter of Hole (Fixed Stone)	Width of Mild Steel Rim on Runners and Fixed Stone, *Min*	Thickness of Mild Steel Rim (on Runner and Fixed Stone), *Min*
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mm ±5	mm +0·5 −0	mm ±5	mm	mm	mm
i)	200	20 or 25	40 or 45	45 to 50	12	1·0
ii)	250	25	45 or 65	55 to 60	12	1·0
iii)	300	30 or 40	75 or 115 or 125	100 to 125	15	1·5
iv)	400	40	75 or 115 or 125	100 to 125	15	1·5
v)	450	40	75 or 115 or 125	100 to 125	18	1·5
vi)	500	40 or 45	75 or 85 or 115	100 to 125	18	1·5
vii)	600	45 or 50	110 or 115	100 to 125	18	3·0

Table 5 Dimensional Requirements for Emery Stone for Flour Mill, Horizontal Type

(*Clause* 7.1)

Sl No.	Diameter	Thickness of Each Stone (Runner and Fixed)	Diameter of Hole (Fixed Stone)	Width of Mild Steel Rim (on Runners and Fixed Stone), *Min*	Thickness of Mild Steel Rim (on Runner and Fixed Stone), *Min*
(1)	(2)	(3)	(4)	(5)	(6)
	mm ±5	mm ±5	mm	mm	mm
i)	350	75	80 to 90	12	1·0
ii)	400	75 or 115	100 to 125	25	1·5
iii)	450	75 or 115	100 to 125	25	1·5
iv)	500	115	150 to 165	25	2·0
v)	600	115	150 to 165	25	2·0
vi)	750	125	150 to 215	40	3·0
vii)	900	125	150 to 215	40	3·0
viii)	1 200	125	150 to 215	40	3·0

in a closed chamber at 100 to 120°C temperature and normal pressure for 12 hours shall remain unaffected from visible cracks.

8.3 Water Absorption

The increase in mass of the stone when subjected to the test as prescribed in IS 1124 : 1974 shall not be more than 1·0 percent by mass.

8.4 Abrasion

The abrasion of the material shall be not more than 1·02 ml/h when determined by the method given in Appendix D of IS 7775 : 1975.

NOTE — The test at **8.3** and **8.4** shall be conducted after 28 days of casting.

9 PACKING AND MARKING

9.1 Packing

The material shall be packed in pairs in wooden crates or as agreed to between the purchaser and the supplier.

9.2 Marking

Each package as well as stone shall be marked with the following information legibly and indelibly:

a) Manufacturer's name or recognized trade-mark,

b) Size and type of the material,

c) Year of manufacture, and

d) Code number.

10 SAMPLING

10.1 Representative samples of the material shall be drawn and conformity of the material to the requirements of the specification shall be determined according to the procedure given in Annex A.

ANNEX A

(*Clause* 10.1)

SAMPLING AND CRITERIA FOR CONFORMITY OF EMERY STONES FOR FLOUR MILL

A-1 SCALE OF SAMPLING

A-1.1 Lot

In any consignment, all pairs of material of the same type, same size and manufactured from same material under relatively similar conditions of manufacture shall be grouped together to constitute a lot.

A-1.2 For ascertaining the conformity of the material in the lot to the requirements of the specification, tests, shall be carried out on samples from each lot separately.

A-1.3 The number of stones to be selected from the lot for this purpose shall depend upon the size of the lot and shall be in accordance with Table 6.

Table 6 Scale of Sampling and Permissible Number of Defectives

(*Clauses* A-1.3, A-2.1 *and* A-2.2)

Number of Pairs of Stones in the Lot	For Visual and Dimensional Requirements		Number of Test for Each of the Requirements Other than Visual and Dimensional
	Sample Size	Permissible Number of Defectives	
(1)	(2)	(3)	(4)
Up to 5	2	0	1
6 to 15	3	0	1
16 to 25	5	0	1
26 to 50	8	0	2
51 to 100	13	1	2
101 and above	20	2	3

A-1.3.1 These pairs shall be selected at random from the lot. In order to ensure the randomness of selection, procedure given in IS 4905 : 1968 may be followed.

A-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

A-2.1 Visual and Dimensional Requirements

Pairs selected according to **A-1.3.1** shall be examined for visual and dimensional requirements. Any pair failing to satisfy one or more of these requirements shall be considered as defectives. The lot shall be considered as conforming to the requirements for these characteristics if the number of defectives found in the sample is less than or equal to the corresponding number given in col 3 of Table 6.

A-2.2 Characteristics Other than Visual and Dimensional

The lot having been found satisfactory in visual and dimensional requirements according to **A-2.1** shall be further tested for the requirements given in **4** and **7**. For this purpose, the number of tests for each of these characteristics given in col 4 of Table 6 shall be conducted. Pairs of stones required for conducting these tests shall be selected from those already tested and found satisfactory according to **A-2.1**.

A-2.2.1 The lot shall be declared as conforming to the requirements of the specification if no failure occurs.

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